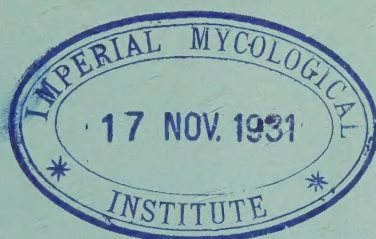


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University of Cambridge
Department of Agriculture Memoirs

Memoir No. 3

A brief summary of the papers published by
the Staffs of the Department of Agriculture
and its Associated Research Institutes during
the period May 1st, 1930—April 30th, 1931.



1931

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FOREWORD.

This Memoir, which is published under the general editorship of the Librarian of the Department, represents an attempt to present as succinctly as possible the contributions made by members of the Staffs of the Department of Agriculture and its Associated Institutes to the development and progress of Agricultural Science, and to indicate to research workers interested the Journals in which the full papers are presented. Each summary is compiled by the author of the paper summarized and is presented, so far as the subject matter will allow, in a non-technical form in order to be of value to the general body of farmers interested in the more recent developments of agricultural scientific research in general and of the activities of this Department in particular.

Requests for further information or criticism arising out of the summaries should be referred to the individual author concerned, suggestions for the improvement or criticism of the Memoir itself should be addressed to the Librarian of the Department.

E. T. H.

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Department of Agriculture Memoirs

THE DEPARTMENT OF AGRICULTURE INCLUDING ESTATE MANAGEMENT, THE DEPARTMENT OF FORESTRY, AND ITS ASSOCIATED RESEARCH INSTITUTES.

Agricultural Education in Cambridge dates from 1892 when the Cambridge and Counties Agricultural Education Committee, an informal body consisting of University Professors and County Council representatives, first organized an Agricultural Course. In 1899 the University created a Department of Agriculture to take over the work of this Committee. A Department of Forestry was created seven years later. The School of Agriculture was built by public subscription in 1909 and expanded by a grant from the Development Commission in 1912. The School of Forestry was built by public subscription aided by government grant early in 1914. The Estate Management branch has been added since the war for the purpose of providing technical and professional assistance in the management of University and College property and with a view to affording opportunities for practical demonstrations in connection with the teaching of Estate Management subjects.

The buildings of the School were further enlarged for the accommodation of the Research Institutes largely by a grant from the Development Commission in 1925-26, and the new buildings provide in addition an enlarged Library and rooms for the Estate Management branch.

The Department of Agriculture, while primarily a teaching department of the University, carries out research in problems of agriculture and cognate sciences through members of its staff and the staffs of the Research Institutes attached to it.

AGRICULTURE.

* Reprints available for free distribution. Please quote marginal number instead of full title. Enquiries for papers not starred should be sent to the author.

121* HANLEY, F.

“Report on the Results of Demonstrations carried out on the Sugar Beet Crop in the Fenland Districts of the Isle of Ely and Huntingdonshire during the Seasons 1927 and 1928.” (*Privately printed*).

On good black fen soil where heavy dressings of artificial manures are usually applied for the potato crop, it would seem wise to restrict the application of mineral manures for the sugar beet crop to a small dressing of super-phosphate or bone super.

On light peaty fen soils evidence was obtained in favour of the use of moderately heavy dressings of mineral manures for the sugar beet crop.

On the stronger types of fenland heavier yields of beet in conjunction with higher sugar percentages were obtained from 18-20 inch rows than from wider rows.

Evidence obtained indicated the desirability of considering singling distance in conjunction with width between rows, *i.e.*, the plant population appeared to be an important factor in determining yield per acre.

159* HANLEY, F. and WOODMAN, R. M.

“The Effect of Sulphuric Acid Treatment on the Germination of Sugar Beet Seed.” *Journ. Soc. Chem. Ind.* XLIX, No. 19, May 1930.

Experiments to determine the effect of sulphuric acid on the germination of sugar beet seed are described.

It is demonstrated that treatment of sugar beet seed with sulphuric acid of approximately 80% concentration leads to a statistically significant increase in germination under the conditions of the experiment.

Rate of germination also is found to be more rapid with acid-treated seed, suggesting that this treatment has useful possibilities in ensuring a quick and even “plant.”

Results at the date of singling indicate that acid treatment leads to no reduction in the average dry weight of seedling, but rather the contrary.

No attempt is made to determine the sterilising effect, if any, of acid-treatment.

HUBBLE, W. K.

“The Development of a Poultry Unit on the University Farm.” *Camb. Univ. Agric. Soc. Mag.* 1931.

This article deals with the development of a Poultry Unit on the University Farm, and gives the history of a successful attempt to build up a 1,000 bird unit suitable for ordinary farm conditions. The building up of a breeding stock from purchased hatching eggs, together with details of feeding and management, housing, and financial costs, are given.

The article is essentially practical in character, and farmers interested in poultry keeping will find that the article is well worth their perusal, particularly the notes dealing with the use of a simple system of artificial lighting, and the value of slatted-floor houses on the general farm.

(Abst. by the Editor.)

WOODMAN, H. E.

"The Modern Aspects of Grassland Husbandry." *The Young Farmers' Journ.*, Dec. 1929 and Jan. 1930.

An account of the Cambridge grassland investigations for non-technical readers.

WOODMAN, H. E.

"Pasture Research at Cambridge." *Die Tierernährung*, 2, 181, 1930.

An account for German readers, of the Cambridge investigations into the nutritive value of pasture.

180* WOODMAN, H. E., NORMAN, D. B. AND FRENCH, M. H.

"Nutritive Value of Pasture, VII. The Influence of the Intensity of Grazing on the Yield, Composition and Nutritive Value of Pasture Herbage (Part III)." *Journ. Agric. Sci.* XXI, 267, 1931.

A continuation of the Cambridge investigations, in which the nutritive properties of pastures under a system of cutting resembling the conditions of rotational grazing with monthly intervals have been investigated.

AGRICULTURAL CHEMISTRY.

CHAPMAN, G. W.

"An Easily Constructed Form of Micro Colorimeter." *The Analyst*, LV, 443, 1930.

AGRICULTURAL ECONOMICS.

BURGESS, C. AND GRAVES, P. E.

"Sugar Beet in the Eastern Counties, 1929." No. 3. (*Farm Economics Branch Report No. 16*). Price 2/6 net. Postage 3d.

This publication is the third and final Report on an investigation into the financial results of sugar beet growing, and the principal factors which influence them. The previous publications dealt exclusively with the 1927 (Report No. 9) and 1928 (Report No. 13) crops, and the present one details the 1929 results, and summarises the three years' experiences. Briefly shown, the over-all results are as follows :—

Over-all Costs and Returns per Acre.

Year.	1927	1928	1929	3 Years together
No. of fields costed ...	182	173	191	546
Acreage costed ...	2303	2036	2750	7089
Average Washed Yield ...	7.7 tons	9.0 tons	9.4 tons	8.7 tons
Average Sugar Content	16.1%	17.9%	17.9%	17.3%
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Total Cost on Farm ...	18 16 2	19 1 7	17 11 9	18 9 10
Transport and G.R. ...	2 5 2	2 6 10	2 9 4	2 7 1
Total Cost at Factory ...	21 1 4	21 8 5	20 1 1	20 16 11
Gross Receipts ...	21 6 10	24 4 9	25 1 6	23 11 0
Cash Profit ...	5 6	2 16 4	5 0 5	2 14 1
Net Credit Allowances ...	3 18 7	4 3 5	3 12 5	3 18 2
Net Profit ...	4 4 1	6 19 9	8 12 10	6 12 3

The Report details the component items of the above figures, and illustrates the effects of variations in the mode of production, in soil, and in climatic and other conditions. Special attention is given to the results of manuring, both with dung and artificials, while the effects of sub-soiling, of different rates and dates of drilling, of different spacing, etc. are shown. Sugar content fluctuations are traced, and an optimum lifting period is suggested. Year to year comparisons are made, and causes of variation examined. In the light of the material which has been collected, certain suggestions are propounded for the consideration of those who are responsible for the fixing of contract prices.

COHEN, RUTH L.

“Factors Affecting the Price of Potatoes in Great Britain.” (*Farm Economics Branch Report, No. 15.*) Price 2/6 net. Postage 2d.

This study represents an attempt to explain the course of potato prices in England from 1885—when the Board of Agriculture first collected returns of yield per acre and amount of production—up to the present day. Relevant *data* available as to amount of production, yield per acre, acreage and imports are examined to see how far their movements in relation to price are explicable by economic theory.

A consideration of the general direction of these various factors—both before and after the war—indicates that potato producers would in general have received a larger aggregate sum had they produced less. The post-war figures for retail prices and production seem, however, to indicate that during this period consumers paid the maximum aggregate sum for their potatoes.

It further appears that variability in price results from alterations in supply (of which home production provides over 90 per cent.). Again, home supply, and hence home price, would be more variable if imports of main crop potatoes were excluded. One of the clearest results that emerges from this investigation is that, both over a period of years, for yearly fluctuations, and, to a certain extent, for monthly changes, imports move in the same direction as prices and are, therefore, more a result than a cause of price changes.

Home production—the important factor as regards prices—varies largely as a result of alterations in the yield per acre. Fluctuations in acreage—following changes in price usually after a lag of 12 to 21 months—though of considerably less importance—are yet not negligible. Changes in yield are not sufficiently regular for it to be possible to advise farmers to alter their acreage in the opposite direction. Hence, apart from attempts to stabilize yields, no substantial steps can be taken to stabilize retail prices from year to year.

But two lines of improvement remain. By co-operation or other means the fluctuations in growers' prices might be reduced to a level more comparable with those of retail prices. Further, by the spread of information, intra-seasonal fluctuations in price—which this study has indicated as being excessive and to the disadvantage of the English farmer—might be made less violent.

KIRKPATRICK, W. H.

“The Seasonal Distribution of Farm Labour Requirements.” (*Farm Economics Branch Report No. 14*). Price 2/- net. Postage 1½d.

Compared with pre-war years, the cost of farm labour at the present day may be said to be approximately twice as great per worker, while the labour bill alone represents as much as 30 per cent. of the total farm payments in the Eastern Counties. It is because of this that the question of the profitable utilisation of the labour staff assumes so great importance at the present time. The only desirable method of decreasing the incidence of wages in the cost of production is to increase production per worker while maintaining wage rates. That on many farms great scope exists for increasing the efficiency of the application of labour is apparent. The establishment of certain “standards” in the organisation of the labour staff should do much to assist the individual farmer to deduce from his own records some idea of where and by how much his organisation falls below “average” efficiency.

This Report suggests standards to be achieved in the work necessary for those enterprises common to farming in the Eastern Counties. The data represent the labour requirements of those enterprises and the seasonal demands they make on the labour staff of the farm. Diagrams are used throughout the text. These illustrate the periods at which crops and live stock call for the greatest attention, how various crops, *e.g.* sugar beet and mangolds, require a maximum application of labour during the same seasons, and the way in which a more regular distribution of labour throughout the year may be effected by the growing of both autumn and spring sown crops. A short discussion is also introduced on the causes which determine the volume of work done in a unit of time, more especially in relation to the growing of crops.

AGRICULTURAL ENTOMOLOGY.

175* PETHERBRIDGE, F. R. AND HEY, G. L.

"The Control of the Common Green Capsid Bug on Red Currants."

Journ. Min. Agric. XXXVII, No. 12, March 1931.

An account is given of 3 experiments carried out in the Eastern Counties to test the comparative values of mineral oil emulsions and the "Long Ashton" type wash for the purpose of killing the eggs of *Lygus pabulinus* in Red Currants.

The results of these experiments are discussed and compared with those of other workers.

An account is given of the injury to the bushes caused by the various sprays.

173* PETHERBRIDGE, F. R. AND HEY, G. L.

"Winter Spraying to Control the Apple Capsid Bug." *Journ. Min. Agric.*, XXXVII, No. 11, Feb. 1931.

An account is given of experiments carried out in 1929 and 1930 at four centres in the Eastern Counties.

From these experiments, from observation made in other orchards, and from the results of other workers there appear to be five possible methods of control. These are enumerated and discussed.

It is difficult to determine which is the most economical and the grower must select the one which is most suited to his own particular case.

The optimum time of application of the spray is discussed and an account is given of varietal differences as regards the amount of control of the pest and extent of damage caused to the trees by the spray.

An example is given of the value of summer spraying as compared with winter spraying.

The effect on other pests of winter spraying for the control of the apple capsid bug is discussed.

SMITH, KENNETH M.

"Insects in Relation to Potato Virus Diseases." *Journ. Min. Agric.* XXXVII, No. 3, June 1930.

An account is given of potato virus diseases and their relationship to the various insects which affect the potato plant. Special attention is paid to plant "carriers" of viruses and the part played by certain Solanaceous weeds as potential reservoirs of infection. *Solanum nigrum*, the black nightshade, is shown to be such a carrier of potato viruses and to be found frequently infected in the field. The aphid *Myzus persicae* transmits the infection to this weed from potatoes growing nearby. As *S. nigrum* can act as a biennial, such infected weeds are a source of infection for any potato crop planted in their vicinity in the following year.

SMITH, KENNETH M.

"A Text Book of Agricultural Entomology." Demy 8vo. Pp. XIV, 286. With a frontispiece and 79 text-figures. 12s. 6d. net. Cambridge University Press, 1931.

This book is based upon the results of much original work, and an attempt has been made to give a complete and up-to-date account of all the insect pests affecting

agricultural crops in the British Isles. The various stages of the insects are described together with their life-histories, distribution and methods of control; the natural enemies are also given. In addition there are chapters dealing with the organisation of agricultural entomology in England and Wales, the methods of insect control and their application in farming practice, and the effect of weather conditions on insect outbreaks. The relationship of insects with the virus diseases of crops is discussed and there are two appendices, one of which gives a list of characteristic symptoms of insect attack on agricultural crops, together with the insect responsible. The other appendix gives a list of common farm weeds and the insect pests associated with them. There are three indices, an index of authors, one of parasites and predators, and a general index.

176* THOMAS, I.

"The Structure and Life History of *Sciara nitidicollis* Meig (Diptera)." Proc. Zoo. Soc. of London, No. 65. Dec. 1930.

The fly *Sciara nitidicollis* Meig. was bred-out from decaying celery roots and potato tubers. In captivity it oviposited freely on scarred or slightly injured cabbage roots, tomato roots, celery roots and potato tubers.

The synonymy of the fly is discussed and an account is given of its life history, together with a description of the egg, the larva, the pupa and the internal anatomy of the imago.

AGRICULTURAL EXPERIMENTATION.

MENZIES-KITCHEN, A. W.

"Developing of Pig Recording in East Anglia." C.U.A.S. Magazine, 1930.

MENZIES-KITCHEN, A. W.

"Economic Aspects of Pig Recording." Journ. Min. Agric., XXXVII, No. 10, Jan. 1931.

This article reviews the results of the East Anglian Pig Recording Scheme. It emphasises the effect on cost of production, of high pre-weaning mortality and inefficient feeding, and indicates lines along which Utility Classes for Recorded Pigs could be developed.

MENZIES-KITCHEN, A. W.

"Pig Recording in the Future." N.P.B.A. Gazette, 1930.

A popular article illustrating the potential value of the Control-Survey Method of Pig Recording.

MENZIES-KITCHEN, A. W.

"Third Report of the East Anglian Pig Recording Scheme Results 1929-1930." Published by the Department of Agriculture, University of Cambridge. Price 1/- net. Postage 2d.

The results indicate that there are wide differences in cost of production between recorded herds. The average number of pigs alive at 6 weeks varied between 6.5 and 11.3 per litter. As it has been calculated that a litter of pigs, at weaning,

has already cost the farmer approximately £10, this figure represents a financial difference of 13/- per pig in favour of the larger litter. Equally striking differences were apparent in feeding costs. The averages of all complete Final Litter Records issued were as follows :—

No. of pigs born alive	...	...	...	...	9.9
No. of pigs at six weeks	...	...	...	...	8.4
Average weight at six weeks	...	...	...	...	19.1
Total litter weight at six weeks	...	...	...	...	160.8
Average weight of pigs at slaughter	...	...	...	...	208.8
Average dead weight of pigs	...	...	...	...	161.4
Average curing weight of pigs	...	...	...	...	131.2
No. of pigs recorded at slaughter	...	...	...	...	6.7
Average loss from live weight/dead weight	...	...	...	...	22.7
Average loss from dead weight/curing weight	...	...	...	...	18.7
Average age in days at slaughter	...	...	...	...	255.0
Average age in days at which pigs should have reached above weight	...	...	...	...	201.1
Average number of days wasted	...	...	...	...	53.9
Average extra cost of production per pig at 3½d. per day	...	...	...	...	15/9d.
Good quality bacon carcasses	...	...	...	...	38.5

ANIMAL BREEDING AND GENETICS.

HAMMOND, J.

“Breeding for Milk.” Year Book of the Central Council of Milk Recording Societies, 1930.

A comparison of the methods employed in different countries. In a character which can be measured only in the female sex the male forms a weak link in the line of inheritance. The value of proven sires is pointed out and methods for producing such sires are suggested.

161* McCANCE, R. A. AND WALTON, A.

“A Double Sex Reversal in a Hen.” *Journ. of Heredity*, XXI, No. 3, 1930.

Description of a hen which assumed male plumage, spurs and male behaviour, and later, with exception of the spurs which were retained, reverted to the normal. No pathological lesions were found in the ovary or ductless glands.

PUNNETT, R. C. AND PEASE, M. S.

“Genetic Studies in Poultry, VIII. On a case of sex-linkage within a breed.” *Journ. Genetics*, XXII, 395-397, 1930.

An experiment was started in 1921 to discover the effect of combining the Plymouth Rock barring (which is a sex-linked dominant character) with the Campine barring (which is an ordinary recessive). This was done by crossing the Plymouth Rock with the Campine and then mating back the F₁ birds to pure gold Campines, keeping always the progeny which showed the dominant barring. Eventually birds

were found which when mated to pure campines, gave only their own type and pure campines. Such birds differ from pure campines only in that they contain the dominant sex-linked barring factor. When mated together they gave, as would be expected, birds homozygous for the sex-linked barring factor, as well as the heterozygotes and pure campines. The downs of the homozygous barred birds differ markedly from the heterozygous barred birds, and since barring is sex-linked, the homozygous birds are always males and the heterozygous birds always females. We have here, then, a pure breed in which the male chicks are sharply distinguished from the female by the down character.

ANIMAL NUTRITION.

171* CRUICKSHANK, ETHEL M.

“Factors Influencing the Size and Iodine Content of the Thyroid in Fowls.” Report 4th World’s Poultry Congress, 1930. Paper No. 36.

The thyroid plays an important part in growth and development and in the regulation of the energy metabolism.

The activity of the glands is measured by its iodine content, since thyroxine—the active principle—contains iodine. Factors affecting the size and iodine content are :—

(1) Food.—The feeding of iodine-rich substances will markedly increase the iodine content of the gland.

(2) Age.—The thyroid weight and iodine content increase in proportion to body weight in the growing bird, the maximum being reached at sexual maturity.

(3) Species.—The weight of thyroid per kilogramme of body weight, the percentage of iodine, and the total thyroid iodine are higher than in mammals.

(4) Seasonal Variation.—The thyroid shows a marked seasonal variation. The average from mid-March to mid-July showing a loss of 35 per cent. as against January to March. The variation in both percentage and total iodine tends to follow the variation in weight. This variation is correlated with the output of iodine during egg-production.

CRUICKSHANK, E. M.

“Recent Research Work in Poultry Nutrition with special reference to the use of Mineral Mixtures.” Paper read at the 4th Annual Surrey County Poultry Conference, Nov. 29th, 1930.

170* HALNAN, E. T.

“The Role of Fibre in Poultry Feeding.” Report 4th World’s Poultry Congress, 1930. Paper No. 34.

A common characteristic of poultry foods is the presence of “crude fibre.” The extent to which this enters into poultry feeding stuffs is discussed and reasons are adduced, supported by experimental evidence, to show that this nutrient is not digested to any great extent by the bird. The work of Mangold and others on the part played by the caeca in the digestion of woody fibre by the bird is shortly summarised. Two diagrams are given which illustrate (a) the slight extent to which the fibre is utilised by poultry (b) the depressant effect of the presence of fibre in a feeding

stuff on the digestibility of the organic matter. In addition, evidence is given showing that the digestibility of the N-free extract of feeding stuffs also appears to be affected. The conclusion is reached that fibre is an undesirable ingredient of poultry foods from a nutritive standpoint, but its inclusion can be justified as a regulator of the amount of food eaten daily by poultry. Data are given showing the way in which this regulation is effected in practice.

HALNAN, E. T.

"The Scientific Principles of Poultry Feeding." *Bull. No. 7, Min. of Agric. and Fish., July 1930.* (Obtainable from H. M. Stat. Office, London. Price 8d. Postage Paid).

This Bulletin of 26 pages contains, in simple language, an account of the results of recent research in poultry nutrition, with special reference to their application to poultry practice. A description of the nutritive functions of food is given, with a short account of the anatomy and functions of the digestive tract and egg-producing organs of the fowl. The quantitative requirements of fowls during growth and egg-production are then dealt with, and short notes on the suitability of various feeding stuffs for poultry feeding follow. Two original tables are given, the first dealing with the protein and energy requirements of fowls for maintenance and egg-production, the second giving the crude nutrients, the digestible protein and energy, and the bulk capacity of the commoner poultry feeding stuffs.

WOODMAN, H. E.

"The Composition, Feeding Value and Uses of the Sugar Beet By-Products." Report of Third Conference on Sugar Beet Problems held at Harper Adams Agricultural College, April 1930.

WOODMAN, H. E.

"Home-Grown Feeding Stuff." *Bulletin No. 13, Min. of Agric. and Fish., Dec. 1930.* (Obtainable from H. M. Stat. Office, London, Price 8d. Postage Paid).

In this Bulletin, the writer describes how feeding stuffs produced on the farm may be used more advantageously in the feeding of stock.

WOODMAN, H. E.

"Oil Cakes and Extracted Meals." *Bulletin No. 11, Min. of Agric. and Fish., March 1931.* (Obtainable from H. M. S. Office, London, Price 7d., Postage Paid).

The main object of this Bulletin is to deal with the composition, feeding value and uses of the common oil cakes and extracted meals.

164* WOODMAN, H. E.

"The Role of Cellulose in Nutrition." *Biol. Rev., 5, 273, 1930.*

A monograph dealing with the subject under the following headings: (1) Chemical nature of cellulose and allied compounds. (2) Digestibility of cellulose in different groups of animals. (3) Food value of cellulose. (4) Mechanism of digestion of cellulose. (5) Products of digestion of cellulose. (6) Physiological value of the products of the bacterial fermentation of cellulose. (7) Alternative theory of digestion of cellulose by bacterial agency. (8) The transformation of cellulose into glucose by the agency of thermophilic cellulose-splitting micro-organisms.

165* WOODMAN, H. E. AND EVANS, R. E.

"Nutritive Value of Pasture. VI. The Utilization by Sheep of Mineral-Deficient Herbage." *Journ. Agric. Sci.*, XX, 587, 1930.

Malnutrition on pasturage of sub-normal mineral content is due directly to the failure of the diet to supply the inorganic materials necessary for constructional purposes and for maintaining the normal balance of minerals in the blood and tissues, and is not to be ascribed to any indirect effect, such as is embodied in the suggestion that the mineral deficiency leads to under-nutrition of the animal by causing a depression of its appetite and its capacity to digest the organic constituents of the herbage.

WOODMAN, H. E., MANSFIELD, W. S. AND GARNER, F. H.

"Molasses Sugar Beet Pulp as a Food for Fattening Cattle." Report to the Ministry of Agriculture and Fisheries, July 1930, on a feeding trial carried out at the University Farm during the winter of 1929-30.

The feeding trial led to the following conclusions:

(a) Molasses beet pulp is equal in feeding value to bruised oats when fed, pound for pound, to mature fattening cattle.

(b) As much as 15 lb. of molasses beet pulp was fed per head per day with successful results and without causing "scouring." The effect of a ration containing a similar allowance of oats was slightly laxative, owing, in all probability, to the relatively high oil content of the oats.

(c) No marked differences were observed between the carcasses of the bullocks fed on molasses beet pulp and those fed on oats. The meat in both cases proved of satisfactory quality and flavour.

ANIMAL PATHOLOGY.

WOOD, W. A.

"Experiments on the Treatment of Parasitic Gastritis in Sheep and Lambs." *Journ. Agric. Sci.* XX, 186, 1930.

During the past few years the question of the treatment of parasitic gastritis in the sheep and the lamb has occupied the attention of several investigators. According to some authors, certain drugs have given quite satisfactory and reliable results, especially against *Haemonchus contortus*, but these results have been contested by other observers.

The experiments which are recorded in this paper were undertaken with the object of testing the anthelmintic properties of various drugs on sheep naturally infested with stomach worms. In order to be of practical value in the field, any preparation used for the treatment of sheep must be reasonably inexpensive, safe in use, easily administered and capable of producing its effects in one or two doses, or when given mixed in the food over a period.

The results of these experiments are, on the whole, disappointing, since they have failed to reveal a reliable treatment for parasitic gastritis of sheep other than that caused by *H. contortus*, but they do confirm the experiments of other workers in that there are several drugs available which are more or less effective against this worm. Of these perhaps copper sulphate would seem to be in many ways the best for general

use, since it is cheap and safe, and can be easily given either dry in capsules or in solution. Better results are obtained when two doses are given, and probably the interval of 7 days between the doses could, with advantage, be shortened to one or two days. The addition of sodium arsenite did not, in these experiments, increase the efficacy of the copper sulphate.

Carbon tetrachloride, given in 12 c.c. doses would seem to be effective against *Haemonchus*. In such doses it is rather expensive, and although in these experiments toxic symptoms were not observed, deaths from smaller doses have been recorded by others.

Tetrachlorethylene (Nema) given in capsules containing 5 c.c. gave, in most cases, good results against *Haemonchus*, and except in Sheep 10 reduced the egg count very considerably. It did, however, cause considerable constipation, and in a few instances post-mortem examination revealed some inflammation of the small intestine. The administration of a laxative with or shortly after the Nema therefore appears to be indicated.

Bunostomum trigonocephalum were found in three animals after the administration of this drug, which does not appear, therefore, to be effective for hookworm in sheep.

The results so far obtained with petroleum ether seem promising but further trials are necessary before any definite conclusion can be arrived at.

Turpentine, chloroform and linseed-oil mixture, chloramine T. sodium pentasulphide, arsenic and monsol do not appear to be effective.

A proprietary copper and arsenic mixture, and copper with arsenic and muriatic acid would not appear to have any advantage over copper alone.

Gow's tobacco powder (which is said to be composed of tobacco with 33 per cent, of sulphur) gave promising results, but tobacco alone, sulphur alone, and tobacco and sulphur in the same doses and in the same proportions as in Gow's powder, did not produce any decrease in the egg count.

The poor results obtained from drugs mixed with the food are disappointing, as this method of administration would be extremely useful in the treatment of large flocks of sheep.

ANIMAL PHYSIOLOGY.

172* HAMMOND, J.

"The Control of Fertility in the Rabbit." Report Fourth World's Poultry Congress, London 1930. Paper No. 151.

A short description of the normal processes of reproduction and the results of recent work on the means by which fertility is controlled.

HAMMOND, J.

"Recent Advances in Agricultural Physiology." *Science Progress*, No. 98, p. 210, 1930.

A brief review of recent work on:—(1) Growth and Under-nutrition and (2) Meat Production.

ANIMAL PRODUCTION.

HAMMOND, J.

"Animal Production—The Influence of Natural Conditions on Animal Production." *Trop. Agric.*, 7, No. 6, p. 147.

An English translation, with additional illustrations, of a paper written in French and summarized in Memoir No. 2, p. 25.

177* HAMMOND, J.

"The Growth of the Rabbit in Relation to Flesh Production." Year Book of the National Rabbit Council, 1931, p. 32.

A short account, illustrated by photographs, of the way in which the shape of the animal changes as it grows up. The importance of this for meat production, and the control of feeding in shaping the development of the various parts of the body and breed characters, are referred to.

HORTICULTURAL CHEMISTRY.

WOODMAN, R. M.

"The Compatibility of Fungicides and Insecticides." N.F.U. Year Book, 1931, 401-407.

Gives a modified chart showing the compatibility or otherwise of certain fungicides and insecticides when used in combination. Discusses wetters, spreaders, emulsifiers and protective colloids, and the rules governing their use with the commoner English fungicides and insecticides in the presence of soft and hard waters.

PLANT BREEDING AND GENETICS.

168* HUDSON, P. S.

"The Present Position of Plant Breeding." *Agric. Prog.*, 1930, 7, 25-36.

A brief account of the aims and methods of the plant breeder: The most outstanding achievements of the breeder in various crops, and the present lines of work, are indicated. The crops are dealt with in turn starting with wheat, where emphasis is laid on the failure on the part of the industrial community to make full use of the improved varieties; work on other cereals is then discussed, followed by herbage crops, root crops, fruits and other horticultural plants, and finally a certain number of tropical crops which have received attention from the plant breeder.

HUDSON, P. S.

"The Imperial Bureau of Plant Genetics."

The full working of this branch of the Imperial Bureau of Plant Genetics began in February, 1930, the first three months having been taken up in preliminary organization.

The first activity of the Bureau was to get into touch with workers in all parts of the Empire so as to know what sort of service the new Bureau might most profitably

provide for overseas workers. To this end a questionnaire was circulated to all Official Correspondents and a number of other plant breeders in all countries of the Empire. From the replies to this questionnaire a full knowledge was obtained of the problems which each worker had to face, with the amount and nature of the work already done and of that in progress, the general agricultural conditions under which his crops were grown and the sort of information which he desired to receive from the Bureau.

Suggestions as to the nature of the Bureau's activities were invited, and the policy of the Bureau was largely framed on the material in these replies, the account of individual worker's difficulties and the suggestions that some of them put forward. A valuable insight was gained into the work in progress in the whole Empire, and some account of this will be circulated when more urgent questions have been dealt with and the routine of the Bureau has been definitely established.

It was realized from the start that one of the most useful functions that could be fulfilled was to keep workers overseas, many of whom have no ready access to current genetical publications, especially those in foreign languages, informed of all the recent developments of the science. The staff of the Bureau is capable of dealing with work in German, French, Italian, Spanish, Dutch, Russian and the Scandinavian languages. From the beginning of 1930, therefore, all the periodicals received in the Library of the School of Agriculture passed through the Deputy Director's hands and any papers bearing on plant breeding were indexed. A large number of periodicals received in the University Library and the Botany School and other scientific departments of the University were also included in this scheme and in order that nothing should be overlooked it was decided to make periodic visits to the London libraries to consult a number of periodicals not available in Cambridge. The index of genetical literature thus built up will in future years constitute the main material by the aid of which the Bureau will be able to answer inquiries on various subjects.

From the original replies to the questionnaire an index was compiled of the subjects on which various officers desired to be kept informed. This, however, covered such a large field that it was ultimately decided to circulate to all officers abstracts in English of all the current papers received during each half year. A number of requests for such summaries had been received from correspondents and it was deemed one of the most valuable services which the Bureau could fulfil.

These abstracts were first issued in typescript but were received by correspondents with such appreciation that permission was obtained from the Council of the Imperial Agricultural Bureaux to have them printed, and they are now being printed and issued at quarterly intervals. The abstracts are printed in such a way that the titles and reference to the papers can be cut out and pasted on to filing cards of the standard library size. To facilitate the filing of these cards the classification number according to the Universal Decimal System is also included.

A considerable number of correspondents have expressed a desire to be instructed in the use of this system so that they may file the references which they receive from the Bureau on the same system. A memorandum on the use of the Universal Decimal Classification has therefore been drawn up, and those sections of the manual of the Institut International de Bibliographie which have a bearing on plant genetics have been translated from the French for the use of these correspondents. Certain other Imperial Agricultural Bureaux have contributed translations of the sections

which concern them. The memorandum has been approved by the Institut International de Bibliographie and is at present in the press.

Bibliographies have been compiled on the following subjects : Wheat Breeding, Barley Breeding, Breeding Varieties Resistant to Disease, Lodging in Cereals, and Oat Breeding. Bibliographies on Rice Breeding and Interspecific Crosses are now in progress.

The efficient working of the Bureau is greatly enhanced by personal contact with the workers themselves. Every effort is made, therefore, to induce officers home on leave to pay a visit to the Bureau and talk over their problems with the Deputy Director. A large number of officers attended the Fifth International Botanical Congress held in Cambridge in August, 1930. This came as a great boon to the Bureau, not only for the contributions to the Genetics and Cytology section, but also for the fact that it enabled contacts to be made with a number of colonial officers, some of whom had not even heard of the existence of the Bureau and who were thus enabled to make up for lost time and make fresh additions to the mailing list and "Information Required" file, sign the Visitors' Book, make suggestions and criticisms in the Suggestion Book and promise to tell all their friends about their new discovery. A number of foreign geneticists also visited the Bureau and cordially entered into co-operation. Since then, increasing numbers of visitors have come to the Bureau, and it is hoped that eventually the number of correspondents who have to be addressed as "Sir" will become very small indeed !

The Bureau is also peculiarly well situated for promoting contacts between workers themselves. Here again the International Botanical Congress enabled the Bureau to effect a number of introductions between members who were known by the Bureau to be interested in similar or allied problems. Interchange of information between such workers has often been established ; sometimes also seed and other material has been obtained for workers situated in out of the way places ; and frequently correspondents have been put in communication with the necessary source of supply of such material.

The fact that the work of the Bureau is performing a real service to overseas workers is indicated by the number of letters of appreciation and congratulation that have been received, and the fact that since the beginning of its activities in February, 1930, large numbers of letters have gone out in answer to definite inquiries. Some of these have involved the making of complete translations, others detailed summaries of foreign papers. These translations are filed at the Bureau and are available for loan for short periods.

SALAMAN, R. N.

"Somatic Mutations in the Potato." Report and Proceedings of the IXth International Horticultural Congress, London, Aug. 1930.

Mutations both germinal and somatic are considered. Two examples of the former are given : in one an albomarginata chimaera-like form appeared at birth and persisted in subsequent tuber generation ; in the other, an F₁ between *S. utile* and a domestic variety where one F₁ plant differed in many characters from its fellow but when grown in the following year from tuber reverted to the normal.

Somatic mutations : both new and old examples are given of tuber mutants and an analysis of Asseyeva's important work. Following her method of obtaining tuber colour mutation by excision of the tuber eye and the formation of secondary

sprouts, the author shows that the Arran Victory mutations which he had studied previously can be made to further mutate so that a purple tuber will give rise to a white tuber and this, in turn, can be made to produce a purple tuber similar to the unmutated original.

Evidence is given for the existence of two types of tuber colour mutant, one of somatic origin, the other genetic. A considerable body of data from crosses made by the author over twenty years ago suggests that pattern colours are controlled by a series of multiple allelomorphs. Similar colour patterns may be produced by somatic mutation but these latter are distinguished by the fact that selfed seedlings from such a plant never reproduce the pattern but are always self coloured.

The author then describes his view of the sequence of events culminating in a tuber colour mutant. Working on his experimental data, an attempt is made to modify Asseyeva's original simple chimaera theory, and the suggestion put forward that the mutated tissue forms an irregular mass within the tuber, any part of which may reach the surface and give rise to skin colour variation.

WATKINS, A. E.

"The Wheat Species : a Critique." *J. Genetics*, 1930, 23, 173-263.

The author reviews the questions of the systematics and variation of the various wheat groups from the genetical standpoint. The parallel variation which exists in the *Emmer* and *vulgare* groups is emphasized and is well expressed by Vavilov's "Law of Homologous Series." Despite the fact that the two groups are clearly separated, it is almost impossible to find any single character which invariably distinguishes them; and the separation appears to be brought about in the following ways: (1) the way in which characters are combined may be different; (2) the extremes of variation may, in a few cases, be confined to different groups; (3) an extreme variant may be common in one group and rare in the other.

The division of the three groups into sub-groups is discussed. On reviewing the characteristics of the members of the three groups it is clear that in passing from the *monococcum* to the *dicoccum* group a number of new characters and a greatly increased diversity appears. The sub-groups of this second group are not clearly marked off, rather they are linked up by intermediate types. The sub-groups of the third, *vulgare*, group, are closely allied and readily intercross.

The role of natural crossing and selection in evolution is discussed, followed by the origin of the genus, the three different distribution centres for the different chromosome groups and the probability of the origin of *T. vulgare* by doubling of the chromosome number in a hybrid between *Aegilops* and one of the emmer wheats.

The nuclear behaviour is described and figured for crosses of the 42 x 28 chromosome groups in which a regular number of bivalents (14) and univalents (7) appear; also the 28 x 14 in which an irregular number (less than 7) of bivalents is usual, and of 42 x 14 with 0.5 bivalents. The cytology and significance of the various *Aegilops* x *Triticum* hybrids is discussed, the various chromosome combinations found in the pentaploid hybrids, Kihara's "Verminderungs" and "Vermehrungsgruppe," and the sterility phenomena involved. Under this latter head are included the various factors influencing the loss of the intermediate chromosome numbers, such as: grain germination and the effect of extra univalents on endosperm development; failure to set grain, brought about by a failure of the egg cell to be fertilized by its own pollen; the failure of the egg to function, the abortion of the embryo, if this

exists; elimination of zygotes, pollen sterility, with elimination of grains with chromosome numbers below 21; a possible loss of univalents at reduction in the megaspore mother cell, in excess of that observed in microspore mother cells; and an unequal segregation of univalents in this stage in the female.

The association of chromosome numbers and group characteristics in the pentaploid hybrids is discussed at some length. It is pointed out that in some cases characters associated with one or other group are transferred in groups in these crosses; the fact that exchanges do rarely occur shews that these are linkage groups involving a number of factors. The general features agree with the view that the tetraploid and hexaploid series carry respectively two and three similar series of factors. The principles of inheritance in certain cases are described.

The speltoid mutants are discussed in relation to the hypothesis that they arise from irregular pairing of the three homologous chromosomes in the hexaploid wheats, with production of gametes of the type *ABB* and *ACC* in place of *ABC* and the subsequent formation of uni-, tri- and quadrivalents and types with 41, 42 and 43 chromosomes.

The agreement between the theory and the results of a number of authors, and at the same time certain discrepancies, are pointed out. Amongst these are the lack of crossing over in the linkage between bearded and speltoid, the elimination of pollen carrying the speltoid character, the defectiveness of normal segregates in certain strains, the non-occurrence of certain types postulated by the theory and the part mutations and factor mutations reported by Nilsson-Ehle.

The phenomenon of "shift" in crosses of tetraploid wheats is examined in the light of the explanation that autosome occurs in connection with some of the chromosomes carrying the modifying factors. The hypothesis of an attachment or linkage between two chromosomes, brought forward to explain this and other phenomena, is shewn to be capable of other explanations. It is pointed out that the cumulative factor hypothesis, so feasible in the case of hexaploid wheats, is applicable with more difficulty to other non-polyploid plants.

In the concluding discussion on the origin of wheat certain difficulties are pointed out with reference to the hypothesis of chromosome doubling after crossing of diploid with some unknown species and of hexaploid with *Aegilops ovata* or *A. cylindrica*. The effect of recombination of characters followed by selection and of loss mutation on the origin of variation within the groups is referred to. It is suggested that the idea of several separate origins of the species conforms most nearly to the facts. Polyploidy affords an explanation of a great number of the phenomena and there is room for a large amount of further investigation into this and other points.

PLANT PATHOLOGY.

163* DILLON WESTON, W. A. R.

"Ineffective Nature of Iodine Dust as a Fungicide against *Tilletia Caries*." *Phytopath.* XX, 753, 1930.

169* DILLON WESTON, W. A. R. AND HALNAN, E. T.

"The Fungicidal Action of Ultra-Violet Radiation." *Phytopath.* XX, 959, 1930.

Experiments carried out with various fungi which were exposed to varying dosages of ultra-violet light clearly demonstrated the fungicidal action of this portion

of the solar spectrum. From the results obtained it is suggested that many of the higher Fungi such as Basidiomycetes—excluding the Uredinales and the Ustilaginales—are intolerant of ultra-violet light and grow better in its absence.

It is generally agreed that growth of mushrooms and similar fructifications depends largely upon moisture, and their natural occurrence during Autumn, Winter and Spring, in damp and wet weather, when the incidence of solar radiation is low, supports the view that ultra-violet light also plays an important rôle in controlling the normal growth processes of these fungi.

PETHERBRIDGE, F. R.

“The Incidence and Control of Apple Scab.” *Proc. of the Association of Economic Biologists*. II. Ann. App. Biol. XVII, No. 2, pp. 416-419.

The results of three years' spraying of apples in the Wisbech area show the cumulative effects of spraying a variety like Worcester with a suitable fungicide.

Worcester trees over 20 years old, in the Eastern Counties are often regarded as being unprofitable. These experiments show that scab is capable of bringing about this state of affairs, but that it can be remedied and a big profit obtained if the trees are sprayed with either lime-sulphur or Bordeaux mixture.

They also show that tar-oil spraying alone is of little value on a variety like Worcester when scab is prevalent. A comparison is made of the value of lime-sulphur and Bordeaux mixture. A table is given, for the use of growers in the Eastern Counties, showing the strengths of lime-sulphur suitable for use on most of the commercial varieties of apples.

A table is given showing the variability of commercial samples of lime-sulphur.

SALAMAN, R. N.

“Virus Disease of the Potato : Streak.” *Nature*. Aug. 16th, 1930.

Whilst streak may be an expression of more than one virus or of a mixture of viruses, it is possible to distinguish at least two types :—

(a) A streak latent in most examples of the variety Di Vernon which produces in healthy Arran Victory but a very slight mottling, but which kills healthy President plants.

(b) A streak latent in Up-to-Date and which may also be found latent in Kerr's Pink and Majestic, which when introduced into healthy Arran Victory and President induces a streak in both which is usually more severe in the Arran Victory.

SMITH, KENNETH M.

“Studies on Potato Virus Diseases. VII. Some experiments with the virus of a potato crinkle with notes on interveinal mosaic.” *Ann. App. Biol.*, XVII, No. 2, 1930.

Experiments are described dealing with the transmission by different methods of two potato viruses, crinkle and interveinal mosaic. Some evidence is brought forward to show that the symptom expression of potato crinkle may vary according to the method of transmission, *i.e.* by grafting, by needle inoculation or by the aphid *Myzus persicae*.

It was found that progressive inoculation of the virus of potato crinkle through the tobacco plant increased its virulence and infective power. Needle inoculation of tobacco with the crinkle virus produced a severe necrotic disease, while aphid

inoculation of tobacco with the same virus produced a different symptom expression of mottling and dark green lines. Both, when returned to healthy potato, produced a severe leaf-drop streak.

The virus of interveinal mosaic produced a ringspot disease when inoculated into tobacco and this increased in virulence with progressive inoculation. When this virus was returned to healthy potato, a severe form of streak resulted which obscured the symptoms of interveinal mosaic.

174* SMITH, KENNETH M.

“Studies on Potato Virus Diseases. VIII. On a Ringspot Virus Affecting Solanaceous Plants.” *Ann. App. Biol.* XVIII, No. 1, 1931.

1. A ringspot virus affecting solanaceous plants is described. This is the first record of the disease in the British Isles.

2. The reactions of the following solanaceous plants to the ringspot virus are described: *S. capsicastrum*, *S. tuberosum* (potato), *S. laciniatum*, *S. nigrum* (black nightshade), *S. nodiflorum*, *Lycopersicum* (tomato), *Nicotiana glauca*, *Datura stramonium* (jimson weed), *Capsicum* spp, *Nicotiana tabacum*.

3. The close parallels in the behaviour of the ringspot to that of the viruses of the potato mosaic group are emphasised. The virus is able to exist in a variety of symptom expressions according to species of host plant and degree of virulence. “Ringspot” is thought to be an alternative symptom expression for a number of mosaic viruses, the development of the ringspot symptoms probably depending upon the degree of virulence of the virus, the type of host plant and possibly the method of infection of that host plant.

4. A marked difference in receptivity of the various solanaceous plants to the ringspot virus when transmitted by the aphid *Myzus persicae* is shown to exist. The virus was transmitted by means of this aphid to *Datura stramonium* and *Capsicum* and not to the other species.

5. The phenomenon of temporary recovery of tobacco plants affected with the ringspot in its virulent form is well illustrated. Plants die down and then re-grow for a period, temporarily symptomless, only to succumb once more to a severe attack. This may happen two or three times before the plant finally remains in a necrotic and moribund condition.

6. In no case was the virus transmitted through the seed of affected plants.

160* TOMKINS, R. G. AND WOODMAN, R. M.

“Stalk Treatment of Fruit and Vegetables for the Prevention of Stalk Rot, with Special Reference to Bananas.” *Journ. Soc. Chem. Ind.*, XLIX, No. 26, June 1930.

As a result of a number of trials of various substances for stem end treatment for the prevention of stalk rot, the use of paraffin wax or vaseline is recommended.

SOIL SCIENCE.

179* NICHOLSON, H. H.

“The Effects of Varied Dressings of Ground Limestone in the Field.” *Journ. Agric. Sci.* XXI, No. 2, 1931.

A summary of the quantitative results obtained in investigating the effects of ground limestone on the lime status of various acid soils. The lime requirements of

the soils varied from .115% downwards, and the limestone was applied at the rate of multiples of 10 cwts. per acre up to 60 cwts. per acre. The experimental plots ($\frac{1}{4}$ acre in ordinary field conditions) were sampled before 'liming' and at intervals of a year afterwards, estimations being made of their lime requirements, residual calcium carbonate, exchangeable calcium oxide and total calcium oxide. The results indicate that ground limestone exerts its fullest effect after a period of one to two years, that the lime status of the field is uneven until this period has elapsed, that the improvement effected in the lime status of a soil by adding 'lime' is far from transient, in spite of the fact that the added carbonate form is fairly quickly converted into the exchangeable calcium base. This conversion proceeds up to an optimum value for each soil, beyond which excess of calcium carbonate added persists in the soil in its original condition for some time.

MISCELLANEOUS.

178* OXLEY, C. D.

"County Council of the Isle of Ely (Education Committee Report)."

Third Clean Milk Competition, 1930-31.

A foreword by the County Medical Officer Dr. French, the Report of both the Clean Milk Competition and the Milkers' Competition by the Inspecting Judge, Mr. J. H. Anderson, and a survey of the methods adopted in the formation of "Milk in Schools" clubs by A. D. Allen, O.B.E., Organiser to the National Milk Publicity Council are given. Following a statement of the aims, method of running the competition and basis of awards, is a discussion of cowshed and dairy technique and a brief description of the methods of testing adopted in the laboratory. A summary of results and awards is appended.

PUBLICATIONS.

Publications of the **Animal Nutrition Research Institute.**

- 1st Report** on the East Anglian Pig Recording Scheme.
(Issued June, 1929)
2nd Report on the East Anglian Pig Recording Scheme.
(Issued Oct. 1929)
3rd Report on the East Anglian Pig Recording Scheme.
(Issued July, 1930)

To be obtained from The Organiser, School of Agriculture. Price 1s. net. Postage 2d.

Cambridge University Agricultural Society Magazine (Issued Annually. 3 numbers comprising a volume).

Vol. 1. (1924-26). Vol. 1. No. 1. 1924 *Out of Print*.

Vol. 2. (1927-29).

Vol. 3. No. 1. 1930. No. 2. 1931.

To be obtained from the Editor, School of Agriculture, Cambridge. Price 2/6 net or 2/9 post free.

Publications of the **Farm Economics Branch** of the Cambridge University Department of Agriculture :—

- Report No. 1.** "An Economic and Financial Analysis of Fourteen East Anglian Farms in 1923-24." (*Second Edition.*) Price 1s. net. Postage 1d.
Report No. 2. "An Economic and Financial Analysis of Six Eastern Counties Farms in 1924-25." (*Second Edition.*) Price 1s. net. Postage 1d.
Report No. 3. "An Economic and Financial Analysis of Fifteen East Anglian Farms in 1924-25." (*Second Edition.*) Price 1s. net. Postage 1d.
Report No. 4. "An Economic and Financial Analysis of Seven Eastern Counties Farms in 1925-26." (*Out of Print.*)
Report No. 5. "A Successful Norfolk Poultry Farm, 1922-26." (*Third Edition.*) Price 1s. net. Postage 1d.
Report No. 6. "An Economic and Financial Analysis of Thirteen East Anglian Farms in 1925-26." Price 1s. net. Postage 1d.
Report No. 7. "The Economy of a Norfolk Fruit Farm, 1923-26." Price 2s. net. Postage 2d.

- Report No. 8.** "An Economic and Financial Analysis of Seven Eastern Counties Farms in 1926-27." Price 1s. net. Postage 1*d.*
- Report No. 9.** "Sugar Beet in the Eastern Counties, 1927." (pp. 106.) Price 3s. net. Postage 3*d.*
- Report No. 10.** "An Economic and Financial Analysis of Fifteen East Anglian Farms in 1926-27." Price 1s. net. Postage 1*d.*
- Report No. 11.** "An Economic and Financial Analysis of Five Eastern Counties Farms in 1927-28." Price 1s. net. Postage 1*d.*
- Report No. 12.** "Four Years' Farming in East Anglia, 1923-27." (pp. 135.) Price 3s. net. Postage 3*d.*
- Report No. 13.** "Sugar Beet in the Eastern Counties, 1928." No. 2. Price 2s. 6*d.* net. Postage 3*d.*
- Report No. 14.** "The Seasonal Distribution of Farm Labour Requirements." Price 2s. net. Postage 1½*d.*
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